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# Beginning C# and .NET

## 2021 Edition

Benjamin Perkins and Jon D. Reid

# BEGINNING C# AND .NET



*Continues*

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# ABOUT THE AUTHORS

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His roles in the IT industry have spanned the entire spectrum including programmer, system architect, technical support engineer, team leader, and mid-level management. While employed at Hewlett-Packard, he received numerous awards, degrees, and certifications. He has a passion for technology and customer service and looks forward to troubleshooting and writing more world-class technical solutions. "My approach is to write code with support in mind, and to write it once correctly and completely so we do not have to come back to it again, except to enhance it."

Benjamin has written numerous magazine articles and training courses and is an active blogger. His catalog of books covers C# Programming, IIS, NHibernate, Open Source, and Microsoft Azure.

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Benjamin is married to Andrea and has two wonderful children, Lea and Noa.

**Jon D. Reid** is a Program Manager in Research and Development for IFS AB (`www.ifs.com`) focusing on Field Service Management. He has coauthored many books on Microsoft technologies, including *Beginning C# 7 Programming with Visual Studio 2017*, *Fast Track C#*, *Pro Visual Studio .NET*, and many others.

# ABOUT THE TECHNICAL EDITOR

**Rod Stephens** is a long-time developer and author who has written more than 250 magazine articles and 35 books that have been translated into different languages around the world. During his career, Rod has worked on an eclectic assortment of applications in such fields as telephone switching, billing, repair dispatching, tax processing, wastewater treatment, concert ticket sales, cartography, and training for professional football teams.

Rod's popular C# Helper website (`www.csharphelper.com`) receives millions of hits per year and contains tips, tricks, and example programs for C# programmers. His VB Helper website (`www.vb-helper.com`) contains similar material for Visual Basic programmers.

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# ACKNOWLEDGMENTS

It takes a lot of work to get content into a presentable format for students and IT professionals to read and get value from. The authors indeed have technical knowledge and experiences to share, but without the technical writers, technical reviewers, developers, editors, publishers, graphic designers, the list goes on, providing their valuable input, a book of high quality could not be written. The rate of change occurs too quickly for an individual to perform all these tasks and still publish a book that is valid before the technology becomes stale. This is why authors worked together with great teams to get all the components of the book together quickly. It was done to ensure that the most up-to-date information gets to the reader while the features are still fresh and current. I would like to thank Rod Stephens for his technical review and suggestions throughout the process. Lastly, I would like to thank all the numerous people behind the scenes who helped get this book together.

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# INTRODUCTION

**THE C# LANGUAGE WAS UNVEILED TO THE WORLD** when Microsoft announced the first version of its .NET Framework in 2002. Since then, its popularity has rocketed, and it has arguably become the language of choice for desktop, web, cloud, and cross-platform developers who use .NET. Part of the appeal of C# comes from its clear syntax, which derives from C/C++ but simplifies some things that have previously discouraged some programmers. Despite this simplification, C# has retained the power of C++, and there is no reason now not to move into C#. The language is not difficult, and it is a great one with which to learn elementary programming techniques. This ease of learning combined with the capabilities of the .NET Framework make C# an excellent way to start your programming career.

The latest release of C# is C# 9 (included with.NET 5.0 and .NET Framework 4.8), which builds on the existing successes and adds even more attractive features. The latest releases of both Visual Studio and Visual Studio Code line of development tools also bring many tweaks and improvements to make your life easier and to dramatically increase your productivity.

This book is intended to teach you about all aspects of C# programming, including the language itself, desktop, cloud, and cross-platform programming, making use of data sources, and some new and advanced techniques. You will also learn about the capabilities of Visual Studio and all the ways that this product can aid your application development.

The book is written in a friendly, mentor-style fashion, with each chapter building on previous ones, and every effort is made to ease you into advanced techniques painlessly. At no point will technical terms appear from nowhere to discourage you from continuing; every concept is introduced and discussed as required. Technical jargon is kept to a minimum, but where it is necessary, it, too, is properly defined and laid out in context.

The authors of this book are both experts in their field and are enthusiastic in their passion for the C# language and .NET. Nowhere will you find two people better qualified to take you under their collective wing and nurture your understanding of C# from first principles to advanced techniques. Along with the fundamental knowledge it provides, this book is packed full of helpful hints, tips, exercises, and full-fledged example code (available for download on this book's web page at `www.wiley.com` and at `github.com/benperk/BeginningCSharpAndDotNET`) that you will find yourself returning to repeatedly as your career progresses.

We pass this knowledge on without begrudging it and hope that you will be able to use it to become the best programmer you can be. Good luck, and all the best!

## WHO THIS BOOK IS FOR

This book is for everyone who wants to learn how to program in C# using .NET. It is for absolute beginners who want to give programming a try by learning a clean, modern, elegant programming

language. But it is also for people familiar with other programming languages who want to explore the .NET platform, as well as for existing .NET developers who want to give Microsoft's .NET flagship language a try.

## WHAT THIS BOOK COVERS

The early chapters cover the language itself, assuming no prior programming experience. If you have programmed in other languages before, much of the material in these chapters will be familiar. Many aspects of C# syntax are shared by other languages, and many structures are common to practically all programming languages (such as looping and branching structures). However, even if you are an experienced programmer, you will benefit from looking through these chapters to learn the specifics of how these techniques apply to C#.

If you are new to programming, you should start from the beginning, where you will learn basic programming concepts and become acquainted with both C# and the .NET platform that underpins it. If you are new to .NET but know how to program, you should read Chapter 1 and then skim through the next few chapters before continuing with the application of the C# language. If you know how to program but have not encountered an object-oriented programming language before, you should read the chapters from Chapter 8 onward.

Alternatively, if you already know the C# language, you might want to concentrate on the chapters dealing with the most recent .NET and C# language developments, specifically the chapters on collections, generics, and C# language enhancements (Chapters 11 and 12).

The chapters in this book have been written with a dual purpose in mind: They can be read sequentially to provide a complete tutorial in the C# language, and they can be dipped into as required for reference material.

In addition to the core material, starting with Chapter 3 most chapters also include a selection of exercises at the end, which you can work through to ensure that you have understood the material. The exercises range from simple multiple choice or true/false questions to more complex exercises that require you to modify or build applications. The answers to all the exercises are provided in the Appendix. You can also find these exercises as part of the `wiley.com` code downloads on this book's page at `www.wiley.com`.

Every chapter receives an overhaul with every new release of C# and .NET, the less relevant material is removed, and new material added. All the code has been tested against the latest version of the development tools used, and all the screenshots have been retaken in the most current version of the Windows OS to provide the most current windows and dialog boxes. New highlights of this edition include the following:

- Additional and improved code examples for you to try out
- Examples of programming ASP.NET Core for running cross-platform
- Examples of programming cloud applications, using Azure SDK to create and access cloud resources